

**WHAT IS CLAIMED IS:**

1. An active radio frequency cavity amplifier comprising:

a housing defining an input cavity and an output cavity;

a plurality of transistors mounted to said housing, each of said plurality of transistors

having an input lead and an output lead;

a first RF power coupling mechanism disposed within the housing in proximity to the input cavity for coupling RF power from a source into the input cavity to generate an RF field;

a first conducting assembly having a plurality of conductors each configured to contact a respective input lead of the plurality of transistors for coupling the RF field in the input cavity to the input leads of the plurality of transistors;

a second conducting assembly having a plurality of conductors each configured to contact a respective output lead of the plurality of transistors for coupling an RF field in the output cavity to the output leads of the plurality of transistors to amplify the RF power from the source; and

a second RF power coupling mechanism disposed within the housing in proximity to the output cavity for coupling amplified RF power from the output cavity to a load.

2. An active radio frequency cavity amplifier as in claim 1, wherein said housing is cylindrically-shaped and further defines an annular cavity encircling said input cavity and an annular cavity encircling said output cavity.

3. An active radio frequency cavity amplifier as in claim 2, wherein said annular cavities are configured to act as RF chokes to prevent the amplified RF power from being short-circuited.

5 4. An active radio frequency cavity amplifier as in claim 1, wherein said housing is constructed from a conductive material.

10 5. An active radio frequency cavity amplifier as in claim 1, wherein each of said first and second RF power coupling mechanisms include a plunger assembly having a plunger configured to move within said housing.

15 6. An active radio frequency cavity amplifier as in claim 5, wherein said plunger assembly of said first RF power coupling mechanism is configured for tuning a resonant frequency of said input cavity, and said plunger assembly of said second RF power coupling mechanism is configured for tuning a resonant frequency of said output cavity.

7. An active radio frequency cavity amplifier as in claim 5, wherein said plunger assembly includes:

20 a coupling capacitor including a conducting cylindrical plunger having a first end and a second end, at least one dielectric disc being coupled to said second end; and

a coaxial section having a center conductor and a matching section disposed in a channel of said cylindrical plunger.

8. A method for amplifying RF power comprising the steps of:

coupling RF power to an active radio frequency cavity amplifier comprising a housing defining an input cavity and an output cavity to generate an RF field within the input cavity; and a plurality of transistors mounted in proximity to said input and output cavities and each of said plurality of transistors having an input lead and an output lead;

tuning the resonant frequency of the input cavity and the resonant frequency of the output cavity;

coupling the RF field in the input cavity to the input leads of the plurality of transistors;

coupling an RF field in the output cavity to the output leads of the plurality of transistors to amplify the RF power from the source; and

coupling amplified RF power from the output cavity.

9. An RF power amplifier comprising:

means for coupling RF power to an active radio frequency cavity amplifier comprising a housing defining an input cavity and an output cavity; said means for coupling generating an RF field within the input cavity and a plurality of transistors mounted in proximity to said input and output cavities and each of said plurality of transistors having an input lead and an output lead; and

means for coupling the RF field in the input cavity to the input leads of the plurality of transistors and for coupling an RF field in the output cavity to the output leads of the plurality of transistors.

10. An RF power amplifier as in Claim 9, further comprising:  
 means for tuning the resonant frequency of the input cavity and the resonant frequency of  
 the output cavity; and  
 5 means for coupling amplified RF power from the output cavity.

11. An RF power amplifier comprising:  
 means for coupling RF power to an active radio frequency cavity amplifier comprising a  
 housing defining an input cavity and an output cavity; said means for coupling generating an RF  
 10 field within the input cavity and a plurality of transistors mounted in proximity to said input and  
 output cavities and each of said plurality of transistors having an input lead and an output lead;  
 and  
 means for tuning the resonant frequency of the input cavity and the resonant frequency of  
 the output cavity.

12. An RF power amplifier as in Claim 11, further comprising:  
 means for coupling the RF field in the input cavity to the input leads of the plurality of  
 transistors and for coupling an RF field in the output cavity to the output leads of the plurality of  
 transistors; and  
 20 means for coupling amplified RF power from the output cavity.

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